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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing
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Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/IB2004/003674

International filing date (day/month/year)
10.11.2004

Priority date (day/month/year)
10.11.2003

International Patent Classification (IPC) or both national classification and IPC
G02B6/42

Applicant
MELEXIS NV

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1 (a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/B2004/003674

Box No. I Basis of the opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
☐ a sequence listing
☐ table(s) related to the sequence listing
 - b. format of material:
☐ in written format
☐ in computer readable form
 - c. time of filing/furnishing:
☐ contained in the international application as filed.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.
PCT/IB2004/003674

**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or
Industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	5,15-18,20-42
	No: Claims	1-4,6-14,19
Inventive step (IS)	Yes: Claims	—
	No: Claims	1-42
Industrial applicability (IA)	Yes: Claims	1-42
	No: Claims	--

2. Citations and explanations

see separate sheet

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/IB2004/003674

Re Item V.

The following documents are referred to in this communication:

- D1 : WO 02/054129 A1 (KRAGL, HANS) 11 July 2002
- D2 : US-A-5 764 832 (TABUCHI ET AL) 9 June 1998
- D3 : US 5 337 398 A (BENZONI ET AL) 9 August 1994
- D4 : DE 101 17 890 A1 (OSRAM OPTO SEMICONDUCTORS) 24 October 2002
- D5 : PATENT ABSTRACTS OF JAPAN, vol. 1995, no. 04, 31 May 1995
& JP 07 030154 A (OMRON CORP), 31 January 1995
- D6 : US 3 859 536 A (THIEL ET AL) 7 January 1975
- D7 : US-A-4 612 670 (HENDERSON ET AL) 16 September 1986

INDEPENDENT CLAIMS 1, 8, AND 9

- 1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claims 1, 8, and 9 is not new in the sense of Article 33(2) PCT.

The specification of claims 1, 8, and 9 is so broad that even well known optical devices that comprise V-grooves to receive an optical fibre and reflective means to redirect light between the optical fibre and an optically active element above the V-groove fall within the scope of the claim. The document D2, for instance, discloses a means for optically coupling an optical fibre to an integrated circuit, comprising (the references in parentheses applying to this document, see in particular column 13, lines 1-23; column 15, line 52 - column 16, line 25; figure 21):

- an optically active element (6a),
- reflecting and receiving means (2a) mounted on a surface of the circuit,

the reflecting and receiving means being adapted to receive the optical fibre (7) into optically coupled connection therewith. The devices specified in claim 1 and 9, and the method specified in claim 8 are therefore not new.

- 2 The objection regarding novelty raised above could have been avoided by adding features to the specification of the independent claims in order to exclude devices and methods as disclosed in document D2 from the scope of the claims. Such

features could e.g. have related to the positioning of the fibre, the reflecting surfaces and the optically active element relative to each other, and/or relative to the optical axis, such as they are illustrated in figure 1 of the application. However, such an amended claim would probably still have lacked an inventive step in the sense of Article 33(3) PCT, for the reasons laid out in the following.

2.1 The document D1 discloses a means for optically coupling an optical fibre to an electric circuit, comprising (the references in parentheses applying to this document, see in particular figure 1a):

- an optically active element (2),
- reflecting and receiving means (3,19) mounted on a surface of the circuit (4),

the reflecting and receiving means being adapted to receive the optical fibre (7) into optically coupled connection therewith.

2.2 Although the document D1 only discloses that the optically active element is fixed to a "carrier comprising an electric circuit" (page 9), it is obvious for the skilled person to apply this teaching also to optically active elements included in integrated electronic circuits. Therefore, even if the disclosure of document D2 is disregarded, the subject-matter of claims 1, 8, and 9 still lacks an inventive step.

INDEPENDENT CLAIMS 25, 30, 35, 38 AND 41

3 Furthermore, the present application does not meet the criteria of Article 33(1) PCT, because the manufacturing methods specified in claims 25, 30, 35, 38 and 41 do not involve an inventive step in the sense of Article 33(3) PCT.

3.1 The Document D1 discloses a method of manufacturing optical data transceivers comprising the steps of (see D1, pages 9-11):

- providing circuits with an optically active element, and
- mounting a reflecting and receiving means on said circuit,

such that the reflecting and receiving means retains the end of an optical fibre, and directs light from the end of an optical fibre to an optically active element, or from the

optically active element to the end of the fibre. The reflecting and receiving means may be manufactured by stamping and/or moulding processes.

3.2 The method specified in claim 25 differs from this in that

- an array of circuits including optically active elements on a wafer, and
- a corresponding array of reflecting and receiving means

is provided. The two arrays are aligned and then separated into individual optical data transceivers. The technical problem solved by these additional features is to cost-effectively produce large quantities of optical data transceivers.

However, the document D2 discloses a manufacturing method for integrated semiconductor optical devices, comprising the steps of (the references in parentheses applying to this document, see column 16, lines 18-25 and figure 22)

- providing an array of optically active elements (6c) on a wafer, and
- providing a corresponding array of reflecting and receiving means (2a).

The two arrays are aligned and then separated into individual optical data transceivers. By aligning the individual elements on a wafer, cost is reduced (column 23, lines 30-36).

3.3 The method specified in claim 30 differs from the disclosure of document D1 in that a quantity of potting compound is dispensed on the surface of the integrated circuit, such that only the reflector means and the optically active elements are left uncovered. The technical problem solved by this feature is to protect the integrated circuit against external influences, such as moisture, while leaving the reflective means and optically active elements accessible for optical coupling.

However, the document D3 discloses (the references in parentheses applying to this document, see figure 12) an assembly comprising optically active elements (42) on a silicon substrate (12). The substrate (12) is potted to provide environmental resistance (column 7, lines 61-62), leaving only the receptacles (50,52) uncovered to allow coupling of the optically active devices with an optical fibre.

3.4 The method specified in claim 35 differs from the disclosure of document D1 in that

the assembly is placed in a moulding tool, ensuring that a projection of the moulding tool seals the reflecting and receiving means, and encapsulating the assembly, except for the portion in contact with the projection, with a plastic compound. The technical problem solved by these steps is to provide a stable housing for the assembly, while leaving the reflective means and optically active elements accessible for optical coupling.

However, the document D4 discloses (the references in parentheses applying to this document) a method for producing a housing for a light-receiving or -emitting semiconductor element, the method comprising the steps of placing an assembly comprising an optically active device (5) and a reflective means (16) in a moulding tool, ensuring that a projection (25) of the moulding tool seals the optically active element and the reflective means, and encapsulating the assembly, except for the portion in contact with the projection, with a plastic compound (see paragraphs 43, 44, 63-66).

3.5 The method specified in claim 38 differs from the disclosure of document D1 in that, prior to mounting the reflecting and receiving means, the following steps are carried out:

- applying a quantity of gel to the circuit to cover the optically active element,
- placing the gel-coated assembly in a moulding tool, ensuring that a projection of the moulding tool is in contact with the assembly,
- encapsulating the assembly in a plastic compound, except the for the portion in contact with the projection.

The technical problem solved by these additional steps is to provide a stable housing for the assembly and protect the optically active element, while leaving the optically active elements accessible for optical coupling.

However, the document D5 discloses (the references in parentheses applying to this document. see the abstract and figures 5 and 7) a method of producing a protective housing for an optical semiconductor element, the method comprising the steps of

- applying a quantity of gel (6) to the circuit to cover the optically active element (2),
- placing the gel-coated assembly in a moulding tool (7), ensuring that a

- projection (12) of the moulding tool is in contact with the assembly, encapsulating the assembly in a plastic compound (9), except the for the portion in contact with the projection,

thereby leaving a window to allow optical coupling to the optically active element.

- 3.6 It is obvious for the skilled person to apply the teachings of documents D2, D3, D4 and D5 to the manufacturing of a device as disclosed in document D1, in order to solve the technical problems as laid out in sections 3.2 to 3.4 above. The methods specified in claims 25, 30, 35, and 38 therefore do not involve an inventive step in the sense of Article 33(3) PCT. For the same reasons claim 41, which specifies a data transceiver manufactured by a method specified in claims 30, 35, or 38, does also not involve an inventive step.

DEPENDENT CLAIMS 2-7, 10-24, 26-29, 31-34, 36, 37, 39, 40, 42

- 4 Dependent claims 2-7, 10-24, 26-29, 31-34, 36, 37, 39, 40, 42 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT), for the following reasons (references in parentheses apply to the respective document cited):
- claims 2-4: the specified details of the reflective and receiving means are disclosed in document D1 (see figure 1);
 - claim 5, 20: a gel blob forming a lens is disclosed in document D6 (column 3, lines 29-56; figure 1), its incorporation into a device as disclosed in document D1 is obvious;
 - claims 6, 7, 23, 31: document D1 discloses an adhesive (K), as well as bond wires (5) and bond pads;
 - claims 10, 11: shaped, and in particular curved reflective inner surfaces are also disclosed in document D1 (figure 1);
 - claims 12-14: document D1 discloses optical data transceivers having one or two light emitting and/or receiving means (figures 1, 15a);
 - claims 15-18: document D7 discloses an optical data transceiver comprising three active elements for emitting and receiving light to/from an external receiver and source, and for detecting light reflected from the end of the optical

fibre (column 5, lines 3-42; column 6, line 66 - column 7, line 39; figures 6, 7), it is obvious to incorporate an optical coupling means as disclosed in document D1 into such a transceiver;

- claim 19: a plastic optical fibre coupled to the optical data transceiver is disclosed in document D1 (figure 5);
- claims 21, 22: it is obvious for the skilled person to incorporate optically active elements on a single or on several independent integrated circuits into an optical data transceiver as disclosed in document D1;
- claim 24: a substrate (4), with electrical connections between the integrated circuits and external circuitry made via the substrate, is disclosed in document D1 (figure 1);
- claims 26, 27, 28: sawing or laser scribing are obvious methods for dicing the wafers disclosed in document D2; this document also discloses transceivers incorporating two or more reflecting and receiving means and integrated circuits;
- claim 29: it is obvious to employ the methods of claims 25 to 28 to manufacture transceivers as claimed in claims 9 to 24.
- claim 32, 33: document D3 shows a potting compound (60) covering the whole of the substrate (12), while leaving exposed means for electrically connecting the substrate to external circuitry (figure 12, 13);
- claim 34: vias and contacts for electrical connections on the opposite side of the substrate are disclosed in document D1 (figure 1);
- claim 36, 37, 39, 40: electrical connections (17) between bond pads and a lead frame (2), wherein the peripheral portions of the lead frame are not encapsulated, are disclosed in document D4;
- claim 42 refers to the features of claims 9 to 24, and thus the arguments given in the discussion of those claims above also apply to this claim.

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